

C-130 IMPEX / INTEX-B Flight summary

date: 1 May 2006 (20060501)

flight number: 6

Take-off: 18:15:18 GMT

Landing: 01:54:11 GMT

Objectives:

- spiral under a Terra (MISR, MOPITT) overpass
- sample mid level Asian pollution
- learn the models' predictive capabilities for Asian plumes

Instrument status:

SABL and HNO_3 in 4-channel CIMS were not operating. CCN-SPA experienced flow problems and only collected data very early in the flight. NCAR- NO_xO_3 experienced a short loss of data early in the flight (~1 hour for NO_x and ~20 min for O_3) but operated very well otherwise. PAN also experienced a short period of data loss, and should have a dedicated seat for the remainder of the science flights to ensure any potential for problems can be addressed. The serial feed from data system also experienced a problem on takeoff requiring the system to be rebooted. This also caused problems for SAFS which was corrected by unplugging the IRIG.

Flight summary:d

The C-130 flight was executed as planned. On takeoff, the serial stream was interrupted and required ADS to reboot. Ascent was also through some heavy cloud and some minor icing occurred (it should also be noted that bb-sized hail fell at Paine Field for a short period before takeoff). Upon reaching 20 kft, Asian pollution was encountered with CO ranging from 250-300 ppbv and $\text{O}_3 > 100$ ppbv. AMS noted high sulfate levels but no significant organic aerosol. Many others noted enhanced concentrations as well. On descent the aircraft reached 10-12 kft before fully emerging from the polluted layer where CO ~150 ppbv and $\text{O}_3 \sim 60$ ppbv persisted to the surface.

The spiral under the Terra satellite was performed under clear skies to the southwest of the cloudiness encountered on the departure from Seattle. Watching for the pollution layer to return, no enhancements were observed on the spiral ascent. On the next descent, thick stratus clouds were encountered at ~3300 ft. Five minute legs were flown just above and within these clouds to examine the response of radicals and soluble species.

Over the next few hours, little variability in CO ~150 ppbv and O_3 of 50-60 ppbv were observed regardless of the altitude flown. Toward the southern end of the flight, lower CO ~120 (briefly down to 100 ppbv) was observed in the free troposphere accompanied by elevated $\text{O}_3 \sim 70$ (briefly up to 100 ppbv). Aside from layers of elevated scattering, little variability was noted during profiling for most of the flight.

Returning toward Seattle, pollution was once again encountered above 20 kft. Periodic spiking in CO > 200 ppbv, $\text{O}_3 > 100$ ppbv, $\text{NO}_y > 1$ ppbv, and elevations in refractory aerosols were observed. PT-RMS reported similar oscillation in acetone and

methanol. AMS reported highly elevated aerosol mass loading of 15-20 ug/m³ that had an “Asian” ratio (3:1) of sulfate and organic aerosol mass. CO continued to increase, exceeding 300 ppbv for a few minutes. The aircraft could not climb above the polluted layer that was observed up to 24 kft. On descent to Seattle, the aircraft emerged from the polluted layer at 20.5 kft with some residual layers of lesser concentrations down to 18 kft. Air below returned to the CO ~150 ppbv and O₃ 60-70 ppbv observed for most of the flight.

Overall summary. Flight objectives were successful. A spiral profile under Terra should provide useful information for MISR, MODIS, and possibly MOPITT. Asian pollution was also sampled at altitude (above ~20 kft) both on the departure and approach to Seattle which contrasted sharply with the background conditions (e.g., CO ~150 to the north and ~120 to the south) observed over the central portion of the flight.